


JUNE 2020



Keeping wattles in place with non-destructive “teepee” staking and installing an erosion control blanket underneath the wattle are effective new techniques to help control stormwater flow.

RESEARCH SOLUTIONS

Iowa finds new tools to control stormwater erosion and sediment at construction sites

Disturbance of earth during transportation construction projects can lead to erosion, with washed-away sediment being deposited elsewhere. State and federal laws require erosion and sediment control (E&SC) measures to protect the environment and infrastructure. While Iowa DOT employs a variety of E&SC practices, it was unknown how effective each practice was—and which promising new techniques could make a difference. Researchers tested current practices, identified new and effective E&SC opportunities, and found important new avenues of inquiry.

THE NEED

When earth is disturbed during construction projects, Iowa DOT employs techniques to control erosion (soil displacement) and sediment (earth materials redeposited elsewhere). E&SC measures are important because they protect farmland and wildlife habitats from stormwater pollution and help control

flooding. They are also the law—Iowa and federal agencies provide requirements for E&SC compliance, and inadequate controls can lead to costly fines and remediation work.

Some of Iowa’s frequently used E&SC techniques include wattles (porous mesh tubes filled with straw or other material to control stormwater

flow and reduce soil degradation), fabric fences to slow water flow and collect sediment, and sediment basins (or retention ponds) to hold water until solid materials can settle to the bottom. However, the effectiveness of these techniques had not been formally evaluated, and Iowa DOT saw room for possible improvements.

(continued)



“We wanted implementable modifications to Iowa’s current erosion and sediment control standards—doing what we’ve been doing, but better. This research took us that next step of the way.”

— MELISSA SERIO,
Iowa DOT Earthwork Field Engineer

RESEARCH APPROACH

Researchers worked over the course of two construction seasons to put Iowa’s E&SC measures to the test, studying in the field how these measures performed on an actual Iowa DOT construction site.

Researchers also looked at alternative E&SC techniques and adaptations that other transportation agencies have used with success to see how well they compare with standard practices in Iowa.

Throughout the project, researchers and Iowa DOT staff who served on the research advisory committee consulted with industry partners and DOT construction field staff. It was important to understand the feasibility of possible changes to practice and identify the right improvements that could be put in place at the right price.

WHAT IOWA LEARNED

A host of configurations were examined, and while some of Iowa’s existing techniques already performed well, several potential improvements became apparent.

Adaptations to wattles that proved particularly successful were a nondestructive staking technique to hold the mesh tube in place, stapling the wattle to the ground to maintain good contact, and using an erosion control blanket underneath to

discourage stormwater from scouring a channel below it.

Simple adjustments to fences included reducing the space between posts, adding wire support to the fence’s fabric backing, and cutting a notch (or weir) at the top of the fence so that overtopping of water could be directed to the most desired location. These are detailed with images and diagrams in the investigators’ [final report](#) and [technology transfer summary](#).

Researchers also quantified these improvements to ensure cost efficiency. By expressing the cost of a specific wattle or fence configuration in terms of dollars per cubic yard of captured sediment, it became clear which new techniques help capture a lot more pollution for just a little more cost.

Even as the research pointed to potential new best practices, it also led to findings that were contrary to expectations. In particular, sediment basins appeared not to be as effective a sediment control measure as had been previously thought. In fact, some of the collected field data collected suggested that water quality decreased at times and water leaving the basins might have more sediment than it had when entering.

Further research in a controlled environment will provide more insight, but these initial findings are extremely valuable as Iowa DOT

seeks to maximize the effectiveness of its E&SC measures.

PUTTING IT TO WORK

With research results in hand, Iowa DOT plans to include the most effective and cost-efficient E&SC treatments identified in this research project in its standard road plans in the near future—mostly likely in spring of 2021.

Research findings on the limitations of sediment basins for sediment control have spurred a follow-up research study, which is being conducted at Auburn University. Basins built and tested in a laboratory setting will help Iowa understand if they are an effective tool or if alternative approaches are needed.

ABOUT THIS PROJECT

REPORT NAME: Field Monitoring of Erosion and Sediment Control Practices and Development of Additional Iowa DOT Design Manual Guidance: [Final Report](#) | [Technology Transfer Summary](#)

REPORT DATE: April 2020

RESEARCH TECHNICAL ADVISORY COMMITTEE CHAIR:

Melissa Serio, P.E.
Earthwork Field Engineer
Iowa DOT
melissa.serio@iowadot.us
515-239-1280

PROJECT MANAGER:

Khyle Clute, P.E.
SPR Research Engineer
Iowa DOT
khyle.clute@iowadot.us
515-239-1646

PRINCIPAL INVESTIGATOR:

Michael Perez, Ph.D.
Auburn University
mike.perez@auburn.edu
334-844-6267

IOWA DOT RESEARCH:
iowadot.gov/research